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April 25, 2014

Congressional Committees

Department of Defense's Waiver of Competitive Prototyping Requirement for the Army's Armored Multi-Purpose Vehicle Program

The Weapon Systems Acquisition Reform Act of 2009, as amended (WSARA), requires the Secretary of Defense to modify guidance to ensure that the acquisition strategy for each major defense acquisition program provides for competitive prototypes before Milestone B approval—which authorizes entry into system development—unless the Milestone Decision Authority waives the requirement.¹ Competitive prototyping, which involves commercial, government, or academic sources producing early prototypes of weapon systems or critical subsystems, can help Department of Defense (DOD) programs reduce technical risk, refine requirements, validate designs and cost estimates, and evaluate manufacturing processes prior to making major commitments of resources. It can also help reduce the time it takes to field a system, and as a result, reduce its acquisition cost. WSARA states that the Milestone Decision Authority may waive the competitive prototyping requirement only on the basis that (1) the cost of producing competitive prototypes exceeds the expected life-cycle benefits (in constant dollars) of producing such prototypes, including the benefits of improved performance and increased technological and design maturity that may be achieved through competitive prototyping; or (2) but for such a waiver, DOD would be unable to meet critical national security objectives.

WSARA also provides that whenever a Milestone Decision Authority authorizes a waiver of the competitive prototyping requirement on the basis of what WSARA describes as “excessive cost,” the Milestone Decision Authority is required to submit notification of the waiver, together with the rationale, to the Comptroller General of the United States at the same time it is submitted to the congressional defense committees. WSARA further provides that no later than 60 days after receipt of a notification of a waiver, we are mandated to review the rationale for the waiver and submit a written assessment of that rationale to the congressional defense committees.²

¹Pub. L. No. 111-23, § 203(a), as amended by the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Pub. L. No. 111-383, § 813. DOD modified its guidance related to the operation of its acquisition system through Directive-Type Memorandum (DTM) 09-027, “Implementation of Weapon Systems Acquisition Reform Act of 2009,” (Dec. 4, 2009, incorporating Change 4, Jan. 11, 2013). This DTM also defined major defense acquisition programs as those estimated by DOD to require an eventual total expenditure for research, development, test, and evaluation or for procurement—including all planned increments—of more than \$365 million or more than \$2.19 billion, respectively, in fiscal year 2000 constant dollars. DOD issued an Interim Instruction 5000.02, “Operation of the Defense Acquisition System,” on November 25, 2013 which cancelled DTM 09-027 and modified the thresholds for major defense acquisition programs. However for purposes of this report we used DTM 09-027 because the competitive prototyping waiver for the Armored Multi-Purpose Vehicle program was completed prior to issuance of the Interim DOD Instruction. The Milestone Decision Authority for major defense acquisition programs is the Under Secretary of Defense for Acquisition, Technology, and Logistics; the head of a DOD component; or, if delegated, the component acquisition executive.

²Pub. L. No. 111-23, § 203(b)(1) & (2).

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On November 12, 2013, we received notice from DOD that it had waived the competitive prototyping requirement for the Army's Armored Multi-Purpose Vehicle (AMPV) program. The Army's AMPV fleet is the proposed replacement to the M113 family of vehicles in the armored brigade combat team. The AMPV is a family of vehicles and will consist of five variants to replace the M113 in the following mission roles: general purpose, medical evacuation, medical treatment, mortar carrier and mission command. The Army has determined that development of the AMPV is necessary due to mobility, survivability, and force protection deficiencies identified in the M113, as well as space, weight, power and cooling limitations that prevent the incorporation of future technologies. The AMPV program's acquisition strategy is based on modifying an existing and operationally proven military vehicle that is currently in production. The Army plans to bypass technology development and begin in system development. The Army modified or eliminated a number of AMPV requirements related to force protection, external fuel tank protection, fuel efficiency, redundant medical data storage devices, and medical refrigeration, to ensure that no technology development was needed for the AMPV.

In this report, we assess DOD's rationale for waiving the competitive prototyping requirement for the AMPV program and the analysis used to support it. To conduct our assessment, we compared the rationale in the waiver to the WSARA requirement to determine the extent to which the waiver is consistent with the statute. In addition, we reviewed the Army's cost-benefit analysis, which provides the data and assumptions on which the waiver is based, the acquisition strategy, and other relevant documentation. We did not independently verify the Army's data on cost and benefits. We also submitted written questions to Army and AMPV program officials to clarify information in program documentation, as necessary.

We conducted this performance audit from March 2014 to April 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Results in Brief

DOD's rationale for waiving WSARA's competitive prototyping requirement for AMPV addresses one of the two bases provided in the statute; namely that the cost of producing competitive prototypes exceeds the expected life-cycle benefits (in constant dollars) of producing the prototypes. According to the waiver, AMPV requirements can be met by modifying an existing military vehicle with mature government-defined mission systems, which obviates the need for prototyping the vehicle. In addition, the program plans to use mission equipment packages for each variant that are already fielded and will not change during system development. The Army expects the risks of integrating the mission equipment and vehicle to be low to moderate. In the waiver, DOD also concluded that the Army's cost-benefit analysis, which examined acquisition strategies with system level prototypes of all five AMPV variants from one or two contractors, was reasonable. The Army's analysis stated that these strategies would increase program costs by \$198 million and \$341 million (in base year 2013 dollars) and add 19 months and 31 months to the program's schedule, respectively. These costs include not only the cost of developing and producing prototypes, but also government program management and testing costs. The AMPV program office also estimated \$0 in life cycle benefits from both prototyping strategies. However, unlike the Air Force's Combat Rescue Helicopter prototyping waiver, the Army did not include any potential benefits associated with reducing development risks. While the Army could have more fully evaluated these potential benefits, its decision not to pursue prototyping for the

AMPV program appears sound. Recognizing that the intent of competitive prototyping is generally to reduce cost and risk, the Army has taken other actions that could achieve these goals, including reducing requirements to ensure no technology development was needed and basing its acquisition strategy on modifying an existing combat vehicle and using existing mission equipment.

Waiver Rationale Is Consistent with WSARA but Supporting Analysis Could Have Included a More Complete Estimate of Potential Benefits

DOD's rationale for waiving WSARA's competitive prototyping requirement for AMPV addressed one of the two bases provided for a waiver in the statute, namely that the cost of producing competitive prototypes exceeds the expected life-cycle benefits, including the benefits of improved performance and increased technological and design maturity that may be achieved through competitive prototyping. In the waiver, DOD also stated that the cost of producing a single prototype of the AMPV or its critical subsystems before Milestone B exceeded the expected life-cycle benefits.³ DOD and the Army reached this conclusion, in part, based on market research, which found that the requirements for the AMPV can be met by modifying existing combat-proven military vehicles with mature government-defined mission systems or mission equipment packages. According to the Army, these mission equipment packages have already been developed and prototyped, fielded in an operational environment, and will not be changed during the development of the AMPV. The Army also expects the risk of integrating this equipment with vehicles to be low to moderate. Given this acquisition strategy, DOD and the Army concluded that neither the life-cycle benefits, nor the benefits of improved performance and increased technical and design maturity from competitive or single prototypes justified the cost of producing such prototypes. We also noted that the Army plans to use a cost-type contract for system development, which, according to DOD acquisition regulations, requires a written determination by the Milestone Decision Authority that a program is so complex and technically challenging that it would not be practicable to reduce program risk to a level that would permit the use of a fixed-price type contract.⁴ According to the AMPV acquisition strategy, a cost-type contract will give the program the most flexibility to support a development effort.

In the waiver, DOD also concluded that the Army's cost-benefit analysis, which examined acquisition strategies with system level prototypes of all five AMPV variants from one or two contractors, was reasonable. The Army's analysis stated that these strategies would increase program costs by \$198 million and \$341 million (in base year 2013 dollars) and add 19 months and 31 months to the program's schedule, respectively, with \$0 in estimated life cycle benefits. The additional 12-months required for the competitive prototyping strategy is the length of time needed to conduct two competitive source selections – one for prototyping and one for system development. In the competitive prototyping scenario, the Army estimated the costs of funding and managing two contractors up through critical design review and initial testing with each

³WSARA provides that whenever a Milestone Decision Authority authorizes a competitive prototyping waiver, the program is required to produce a prototype prior to Milestone B approval if the expected life-cycle benefits (in constant dollars) of producing such prototype exceed its cost and its production is consistent with achieving critical national security objectives. Pub. L. No. 111-23, § 203(a)(3)(A).

⁴Defense Federal Acquisition Regulation Supplement § 234.004(2)(i)(C)(1). Cost-reimbursement contracts, also known as cost-type contracts, provide for payment of allowable incurred costs, to the extent prescribed in the contract. This contract type places most of the risk on the government, which may pay more than budgeted should incurred costs be more than expected when the contract is signed.

contractor producing six prototype vehicles - one of each variant and one live fire test vehicle. The Army's estimated costs for competitive prototyping include not only the cost of developing and producing prototypes, but also systems engineering, government program management, and testing costs. Table 1 includes a breakdown of the additional cost the Army estimated it would incur by competitively prototyping the AMPV pre-Milestone B versus starting the program with one contractor at Milestone B. The Army conducted a similar analysis for the single prototype scenario and concluded that due to the maturity of available systems to meet program requirements, neither of the prototyping strategies yielded additional life-cycle benefits, either in terms of improved performance or increased technological and design maturity, which would justify the costs.

Table 1: Breakdown of Army's Estimated Cost of Competitively Prototyping AMPV

Research, Development, Test and Evaluation Cost Element	Additional cost for competitive prototyping (in base year 2013 millions)
Development engineering	\$99.65
Prototype manufacturing	\$27.35
Systems engineering / program management	\$107.39
System test and evaluation	\$69.45
Other RDT&E (contractor fee, general and administrative expenses)	\$25.27
Other RDT&E	\$11.51
Total	\$340.63

Source: AMPV Program Office.

Note: Costs include two contractors producing a total of six prototype vehicles – one of each of the five AMPV variants and one live-fire test vehicle.

The Army's approach to its cost-benefit analysis was consistent with certain key principles in DOD's policy on economic analysis, which states that each feasible alternative for meeting an objective and its life cycle cost must be considered; however, the Army could have improved its application of another key principle related to life cycle benefits by including a more complete estimate of potential benefits in its analysis.⁵ In its cost-benefit analysis, the Army evaluated all three prototyping scenarios mentioned in WSARA or DOD's implementing memorandum, producing system-level competitive prototypes, a single system-level prototype, or critical subsystem prototypes before Milestone B. However, DOD and the Army did not evaluate whether to prototype specific AMPV variants. According to the Army, the mortar carrier and medical transport variants will require a more complicated design effort and prototyping these two variants could have reduced risk in meeting variant specific requirements. The AMPV program office also estimated \$0 in life cycle benefits from producing system-level competitive prototypes, a single system-level prototype, or critical subsystem prototypes before Milestone B. However, unlike the prototyping waiver for the Combat Rescue Helicopter, the Army did not include any potential benefits associated with reducing development cost risks.⁶ According to the Army, three of the main areas of cost risk in the AMPV life-cycle estimate are production prove out testing, prototype hull and integration development efforts, and manufacturing cost. These risks could potentially be reduced, or at least better understood, through pre-Milestone B prototyping, but these benefits were not evaluated in the Army's cost-benefit analysis. While the Army could have more fully evaluated these potential benefits, its decision not to pursue

⁵DOD Instruction 7041.3, Economic Analysis for Decisionmaking, Encl. 3, para. E3.1.1 (Nov. 7, 1995).

⁶See GAO, *Department of Defense's Waiver of Competitive Prototyping Requirements for Combat Rescue Helicopter Program*, [GAO-13-313R](#) (Washington, D.C.: Mar. 7, 2013).

prototyping for the AMPV program appears sound. Recognizing that the intent of competitive prototyping is generally to reduce cost and risk, the Army has taken other actions that could achieve these goals, including reducing requirements to ensure no technology development was needed and basing its acquisition strategy on modifying an existing combat vehicle and using existing mission equipment.

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for comment. In its written comments, which are reprinted in the enclosure, DOD agreed with our assessment of the AMPV competitive prototyping waiver.

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We are sending copies of this report to interested congressional committees, the Secretary of Defense and the Secretary of the Army. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions, please contact me at (202) 512-4841 or sullivanm@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report were Ron Schwenn, Assistant Director; Andrea M. Bivens; Kristine R. Hassinger; Kenneth E. Patton; and Carol Petersen.

A handwritten signature in black ink, appearing to read 'Michael J. Sullivan', with a stylized, flowing script.

Michael J. Sullivan
Director, Acquisition and Sourcing Management

Enclosure

List of Committees

The Honorable Carl Levin
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United States Senate

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Comments from the Department of Defense



ACQUISITION

ASSISTANT SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

APR 22 2014

Mr. Michael J. Sullivan
Director, Acquisition and Sourcing Management
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Sullivan:

We have reviewed the Government Accountability Office (GAO) Draft Report, GAO-14-521R, "Department of Defense's Waiver of Competitive Prototyping Requirement for the Army's Armored Multi-Purpose Vehicle," dated April 14, 2014 (GAO Code 121205). The Department appreciates the opportunity to comment on the draft report.

The GAO concluded that the Armored Multi-Purpose Vehicle (AMPV) Program rationale for the competitive prototype requirement waiver is consistent with the Weapon Systems Acquisition Reform Act of 2009, Public Law 111-23. We agree with that conclusion. While the Department is fully vested in the application of competitive prototyping and believes it can provide value and risk reduction to programs, competitive prototyping should be tailored to the needs and risks of each specific program, balanced with any potential adverse cost and schedule impact.

For the AMPV program, the Business Case Analysis sufficiently substantiated that it was not in the best interest of the Department to expend fiscal, manpower, and scheduling resources on competitive prototyping. We will consider GAO's comments for future Competitive Prototype waivers to ensure that the Department makes the best decision for each unique program.

Thank you again for the opportunity to comment on this report.

Sincerely,

A handwritten signature in blue ink, which appears to read "Katrina McFarland", is positioned above the printed name.

Katrina McFarland

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